



Accelerated Bridge Construction

Research, Design and Practice

University of Buffalo
April 2011



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Presentation Outline

- Research
 - Accelerated Bridge Construction (ABC) initial efforts
- Design
 - Program implementation
- Practice
 - Projects

Research *Outline*

- Perform scanning tours
- Conduct pilot project
- Identify a program of projects
- Get involved nationally





- Market internally and externally
- Conduct workshops
- Engage industry

Research

Scanning Tours

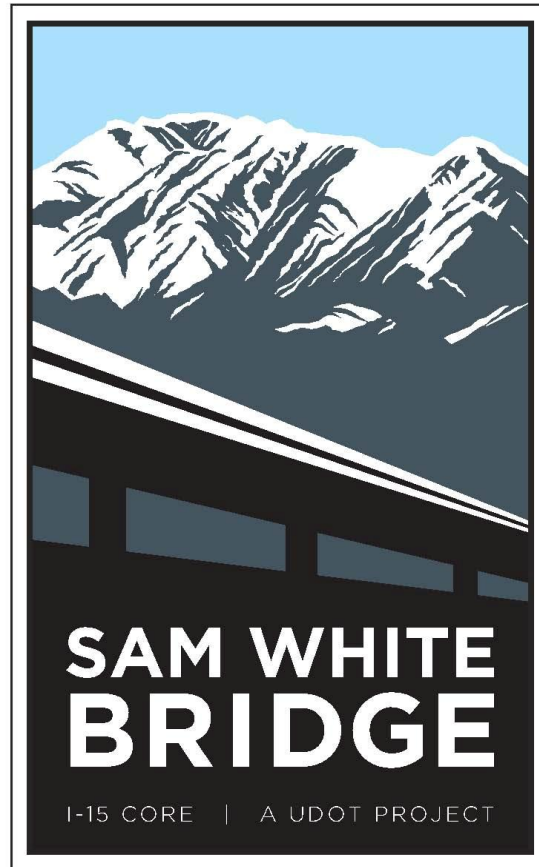
Research

Pilot Project



- Obtain senior leadership involvement
- Promote marketing and media plan
- Develop messaging
- Prepare visual animation
- Evaluate project risks
- Define scope, schedule and budget
- Identify procurement method

Research *Messaging*



354 Feet Long | Two Spans | One Big Night



Research

Visual Animation



Research

Visual Animation





Research

Program of Projects

- Prescriptive projects – gain experience
 - Design-Bid-Build
 - Construction Manager General Contractor (CMGC)
- Performance projects – innovations led by contractor
 - Design-Build



Research

Get Involved Nationally

- Coordinate with FHWA
- Participate in AASHTO Subcommittees
- Host showcase projects
- Share lessons learned and best practices



Design *Outline*



- Educate and communicate with industry
- Evaluate projects
- Implement standardization
- Improve based on lessons learned

Design

Educate and Communicate With Industry



■ ABC goals

- Relentlessly pursue reducing traffic congestion during construction
- Add value by furthering Department themes and meeting project goals
- Improve worker safety and safety to the traveling public
- Improve quality

Design

Evaluate Projects

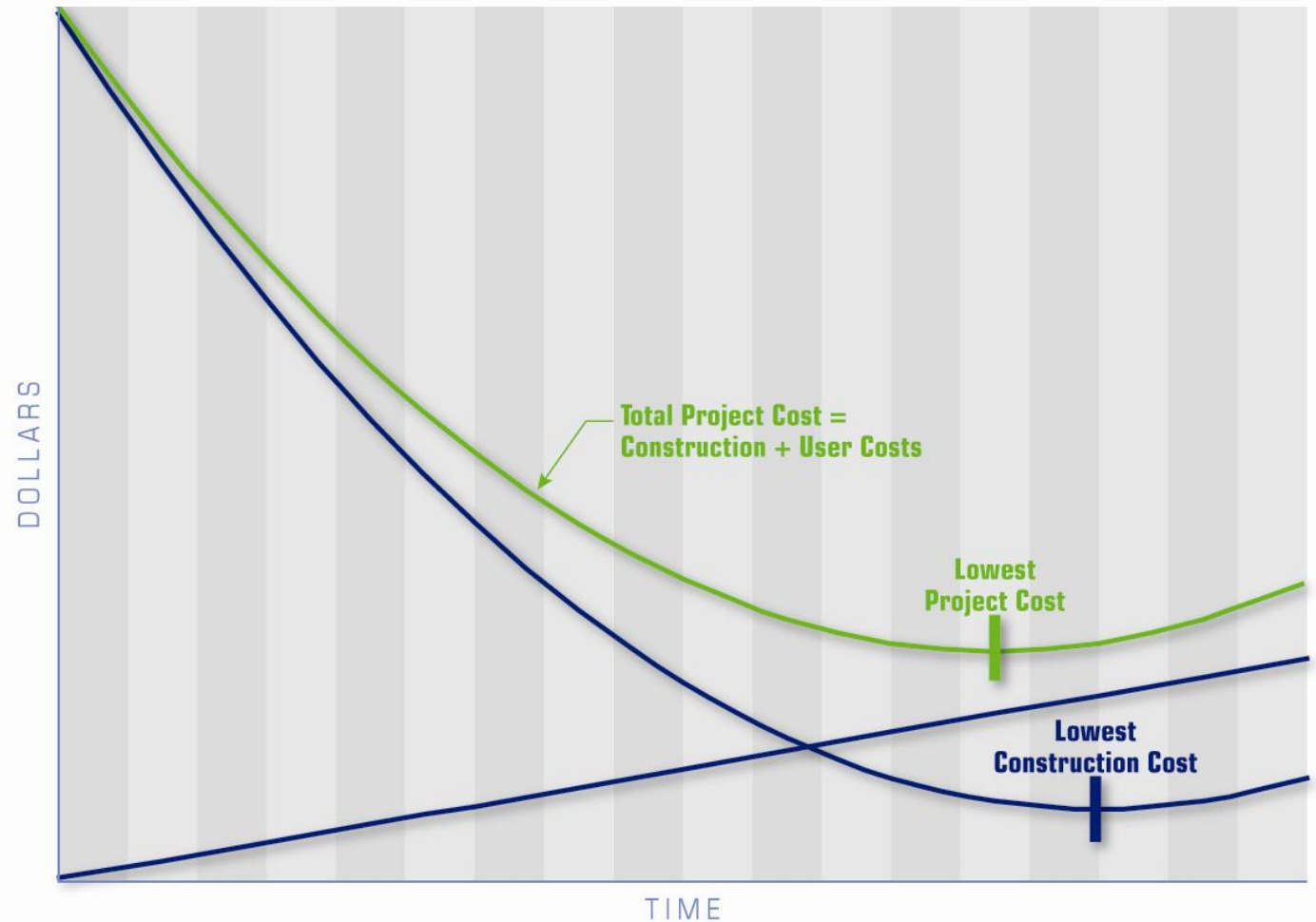


- Scope
- Schedule
- Budget
- Quality
- Risk
- Communications
- Procurement

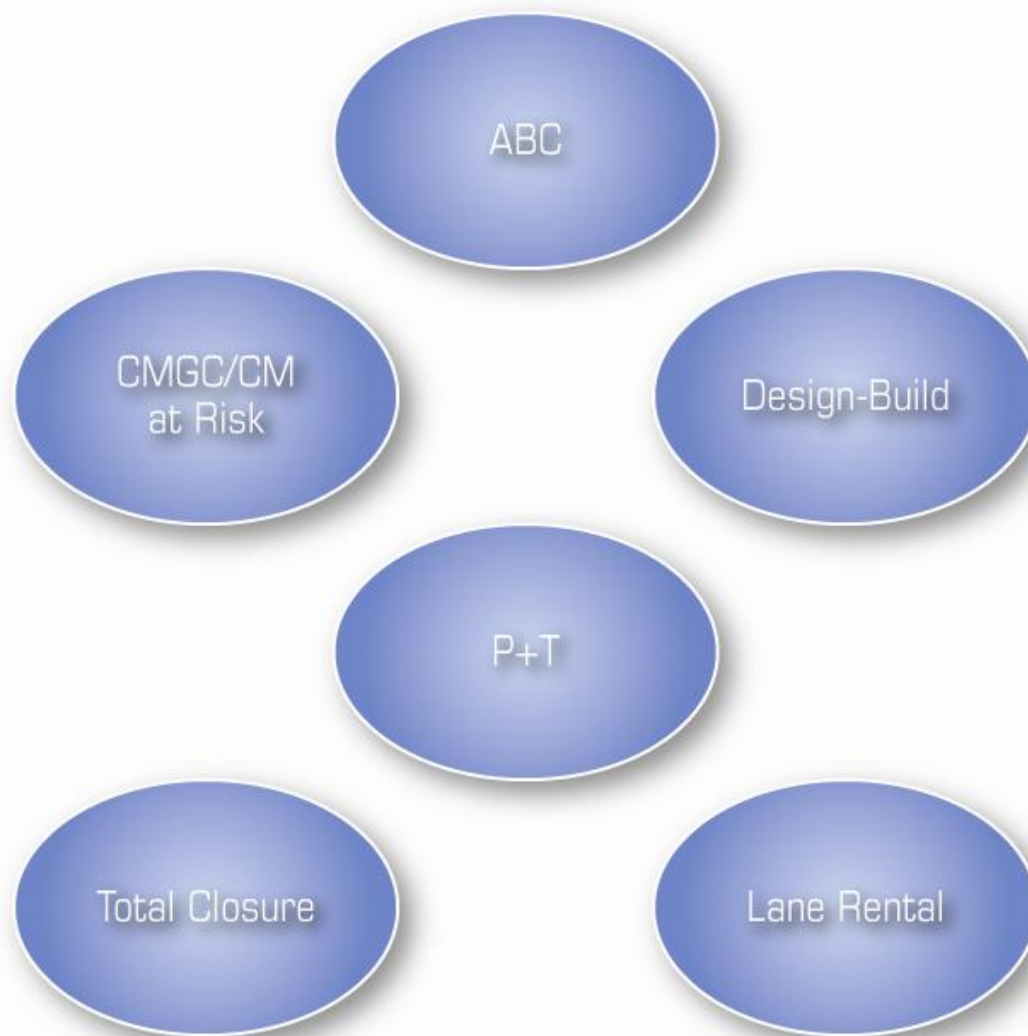


Design *Evaluate Projects*

Total Project Cost



Design *Evaluate Projects*





- Develop guidelines for ABC project inclusion
- Develop typical details and manuals
- Include user costs in analysis
- Encourage innovation
- Provide training and obtain feedback

Design

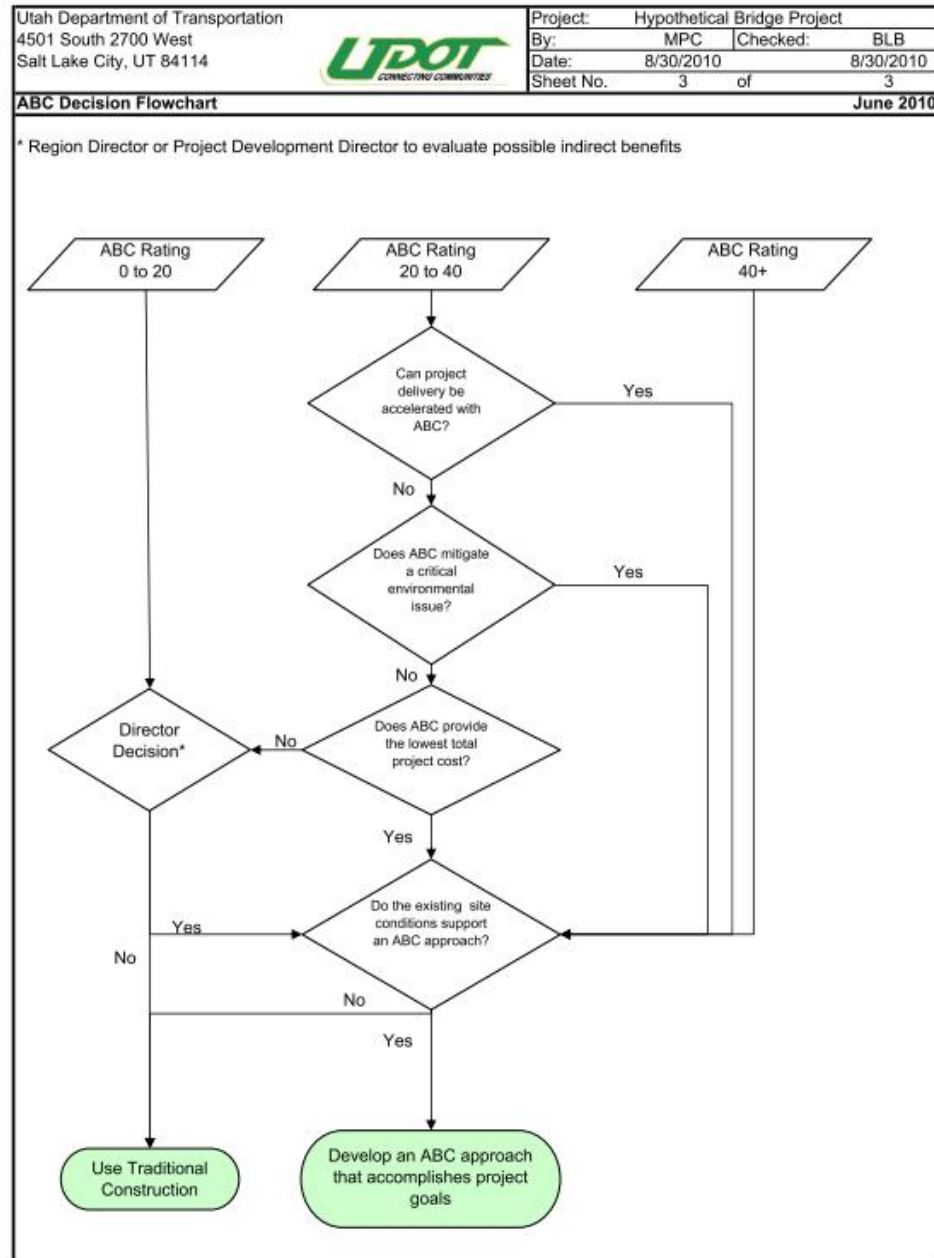
Implement Standardization

Design Implement Standardization



Utah Department of Transportation 4501 South 2700 West Salt Lake City, UT 84114		UTDOT CONNECTING COMMUNITIES		Project: Hypothetical Bridge Project	
				By: MPC	Checked: BLB
				Date: 8/30/2010	8/30/2010
				Sheet No. 1	of 3
ABC Rating Procedure				June 2010	
Enter values for each aspect of the project. Attach applicable supporting data.					
Average Daily Traffic Combined on and under Enter 5 for Interstate Highways	<input type="text" value="5"/>	0 1 2 3 4 5	No traffic impacts Less than 5000 5000 to 10000 10000 to 15000 15000 to 20000 More than 20000		
Delay/Detour Time	<input type="text" value="2"/>	0 1 2 3 4 5	No delays Less than 5 minutes 5-10 minutes 10-15 minutes 15-20 minutes More than 20 minutes		
Bridge Classification	<input type="text" value="1"/>	1 3 5	Normal Bridge Essential Bridge Critical Bridge		
User Costs	<input type="text" value="4"/>	0 1 2 3 4 5	No user costs Less than \$10,000 \$10,000 to \$50,000 \$50,000 to \$75,000 \$75,000 to \$100,000 More than \$100,000		
Economy of Scale (total number of spans)	<input type="text" value="2"/>	0 1 2 3	1 span 2 to 3 spans 4 to 5 spans More than 5 spans		
Use of Typical Details	<input type="text" value="1"/>	1 3 5	Complex geometry or unfavorable site conditions Some complexity, but favorable site conditions Simple geometry and favorable site conditions		
Safety	<input type="text" value="5"/>	1 2 3 4 5	Short duration impact with simple MOT scheme Short duration impact with multiple traffic shifts Normal duration impact with multiple traffic shifts Extended duration impact with multiple traffic shifts Extended duration impact with complex MOT scheme		
Railroad Impacts	<input type="text" value="0"/>	0 3 5	No railroad or minor railroad spur One mainline railroad track Multiple mainline railroad tracks		

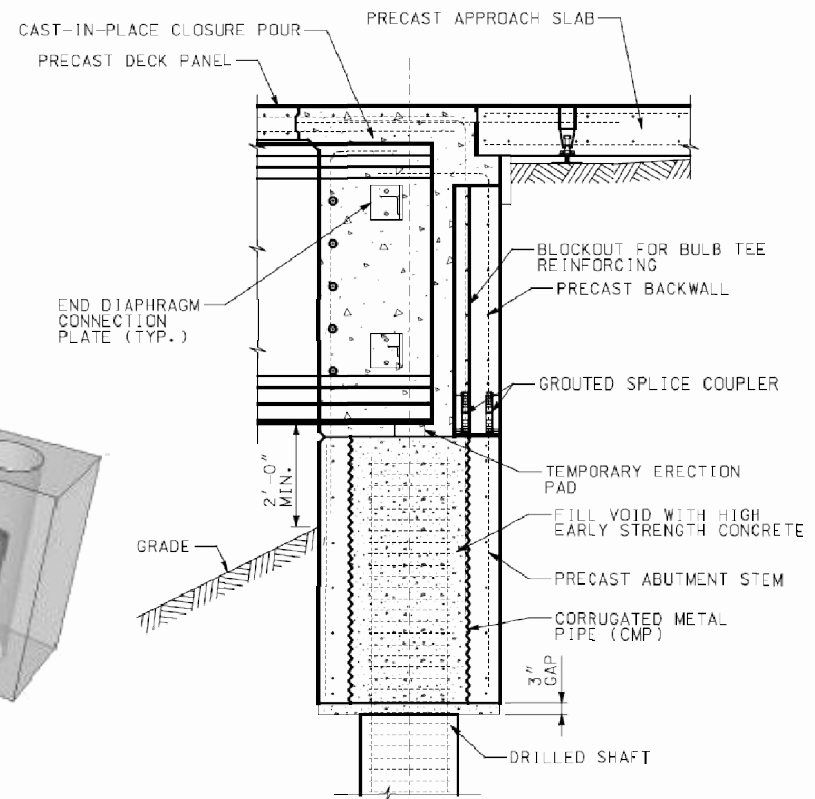
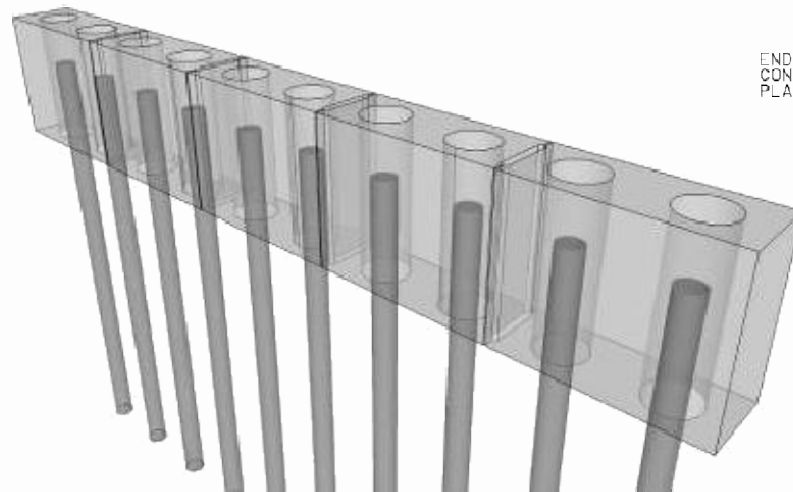
Design Implement Standardization





Design Implement Standardization

■ ABC Manual and Standard Drawings



ABUTMENT SECTION **A**
IA-1

NOTE: ALL ABUTMENT REINFORCEMENT NOT SHOWN FOR CLARITY



- Perform program review
- Find program deficiencies
- Repair deficiencies
- Review design decisions
- Measure design assumptions vs. reality

Design

Lessons Learned

Practice *Outline*



- Innovative elements and methods
- Timeline and history
- Project highlights
- Upcoming projects
- Program evaluation

Practice

ABC Components



Accelerated Bridge Construction Components

Foundation & Wall Elements	Rapid Embankment Construction	Prefabricated Bridge Elements & Systems	Structural Placement Methods	Fast Track Contracting
<p>Continuous Flight Auger Piles</p> <p>Geosynthetic Reinforced Soil (GRS) Integrated Bridge System</p>	<p>EPS Geofoam</p>	<p>Prefabricated Elements</p> <ul style="list-style-type: none"> - Superstructure - Substructure <p>Prefabricated Systems</p> <ul style="list-style-type: none"> - Superstructure - Substructure - Total Bridge 	<p>Self-Propelled Modular Transporters (SPMTs)</p> <p>Longitudinal launching</p> <p>Horizontal sliding or skidding</p> <p>Other heavy lifting equipment & methods</p> <p>Conventional lifting equipment & methods</p>	<p>Innovative Contracting</p> <ul style="list-style-type: none"> - Best Value - CMGC method - Design-Build - A+B - A+B+C - Warranties

Practice

Definition of PBES

PBES consists of bridge structural elements & systems that are built off the bridge alignment to accelerate on-site construction time relative to conventional practice.



Practice

Benefits of PBES

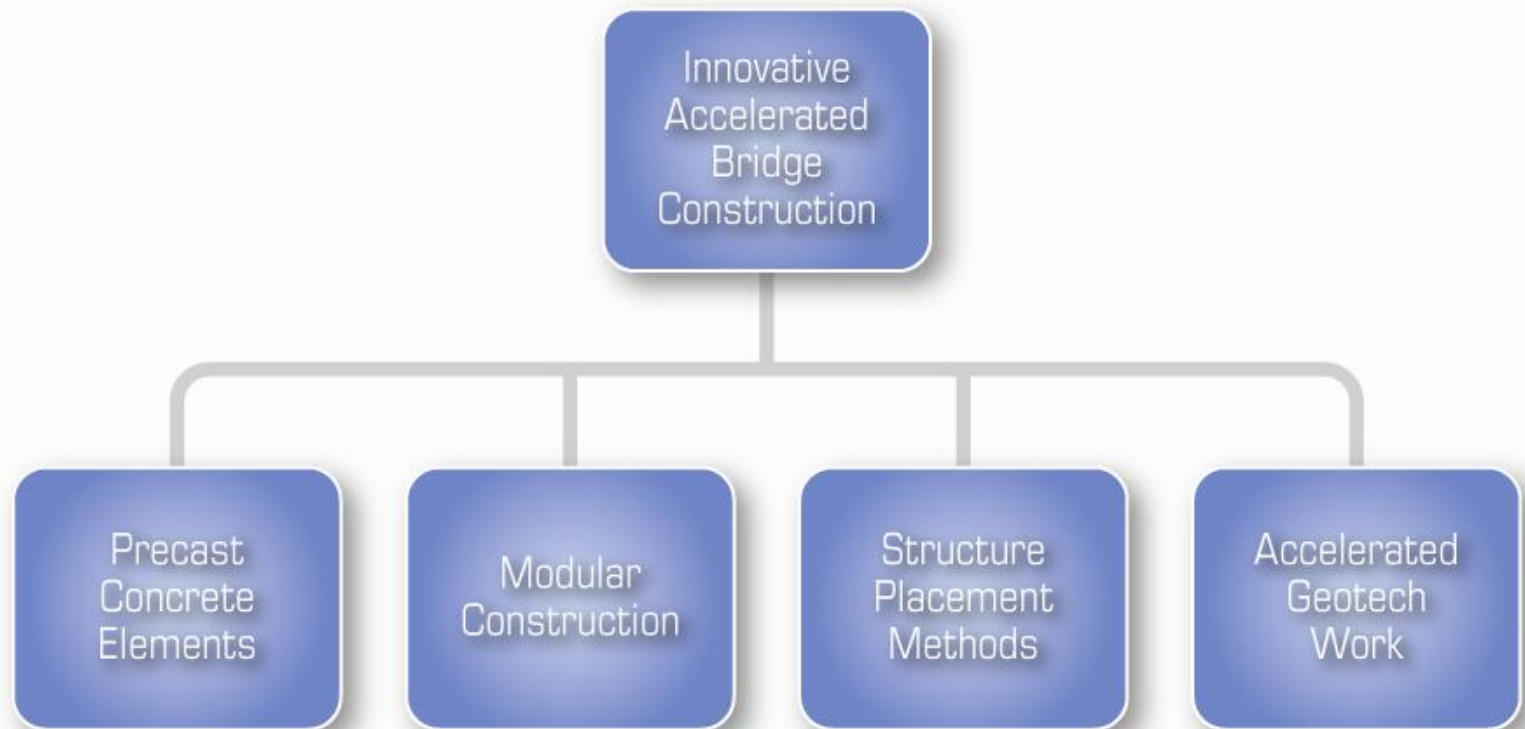


- Significant advantages
 - Reduced on-site construction time
 - Minimized traffic disruption – *months to days*
 - Reduced environmental impact
 - Improved work zone & worker safety
 - Provides positive cost-benefit ratios when user costs are considered
 - Improved product quality – *controlled environment, cure times, easier access, etc.*



Practice

Innovative Elements and Methods





Practice

Innovative Elements and Methods

Precast Concrete Elements; I-80; Wanship Bridge





Practice

Innovative Elements and Methods

Modular Construction; I-215 over 3670 South



Practice

Innovative Elements and Methods

Structure Placement Methods





Practice

Innovative Elements and Methods

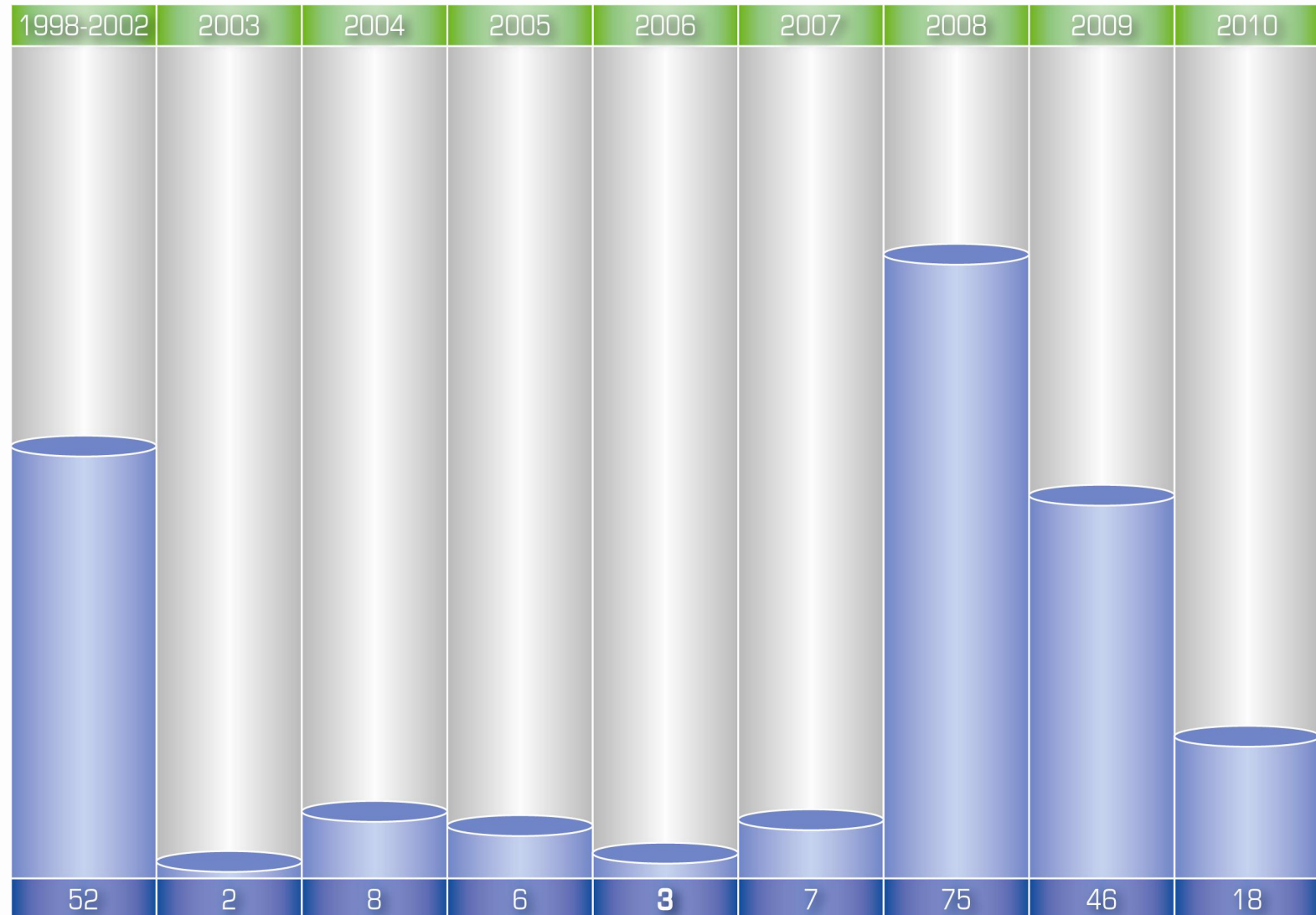
Accelerated Geotechnical; Geofoam Embankment





Practice

Timeline and History





ABC Method / Element

Bridge Launch	2
Self Propelled Modular Transporters (SPMT)	23
Slide-in	5
Heavy Lift Cranes	2
Half Depth Precast Deck Panels	63
Full Depth Precast Deck Panels	31
Precast Voids Slabs	3
Approach Slab Panels	15
Precast Sleeper Slabs	14
Precast Abutments	6
Precast Bent Caps	3
Precast Columns	1
Prefabricated Pedestrian Bridge	5
Precast Box Culvert	44

Number of Bridges

Practice

Timeline and History

Practice

Project Highlights

800 North over I-15; Precast Deck Panels; CMGC



Practice

Project Highlights

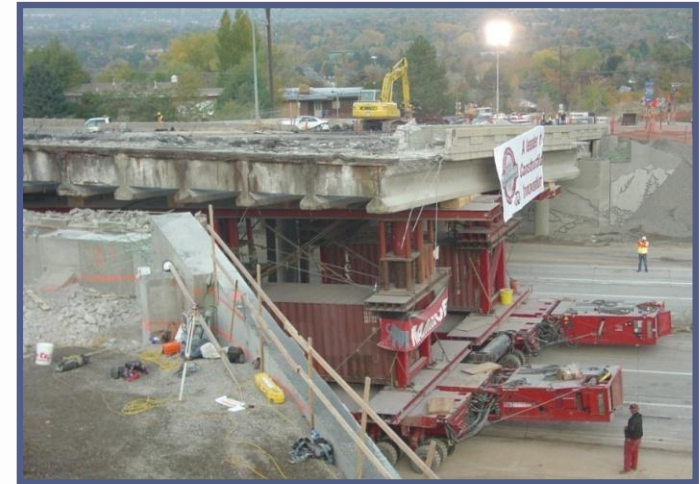
Riverdale Road over I-84 ; Lego Bridge; CMGC



Practice

Project Highlights

4500 South over I-215; SPMT; CMGC



Practice

Project Highlights

I-80; Lambs Canyon Bridge; SPMT; Design-Build



Practice

Project Highlights

I-80; State Street to 1300 East; SPMT; CMGC



Practice

Project Highlights

I-70; Eagle Canyon Bridge; Precast Deck Panels; CMGC



Practice

Project Highlights

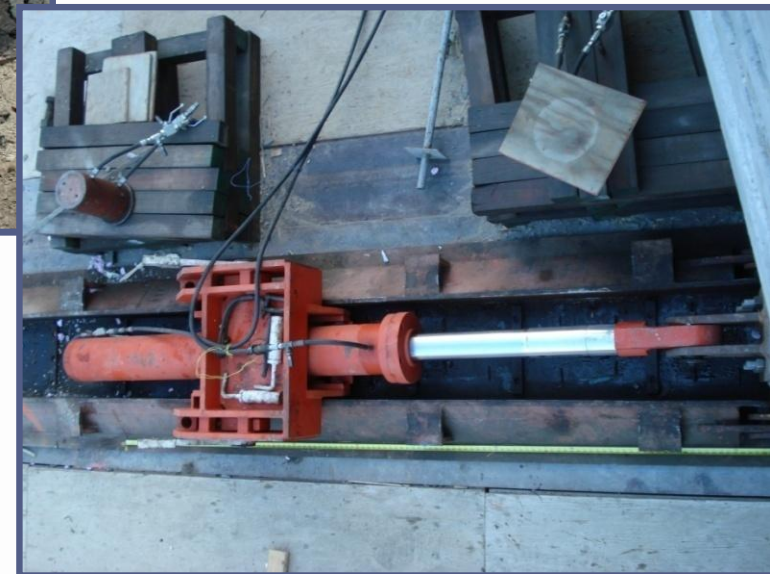
SR-66 Over Weber River; Slide-in; Design-Bid-Build



Practice

Project Highlights

I-80; Two Bridges Near Echo Junction; Slide-in; Design-Build



Practice

Project Highlights

I-80 over 2300 East; Slide-in; Design-Build



Practice

Project Highlights

South Layton Interchange; Launch; Design-Build



Practice

Project Highlights

U.S. 89 over I-15; SPMT; Design-Build



Practice

Project Highlights

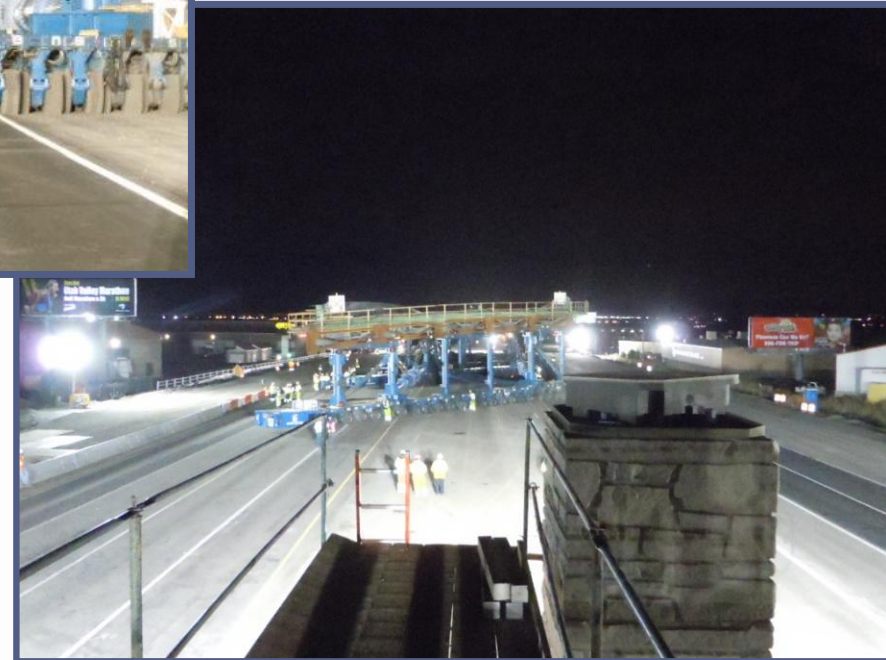
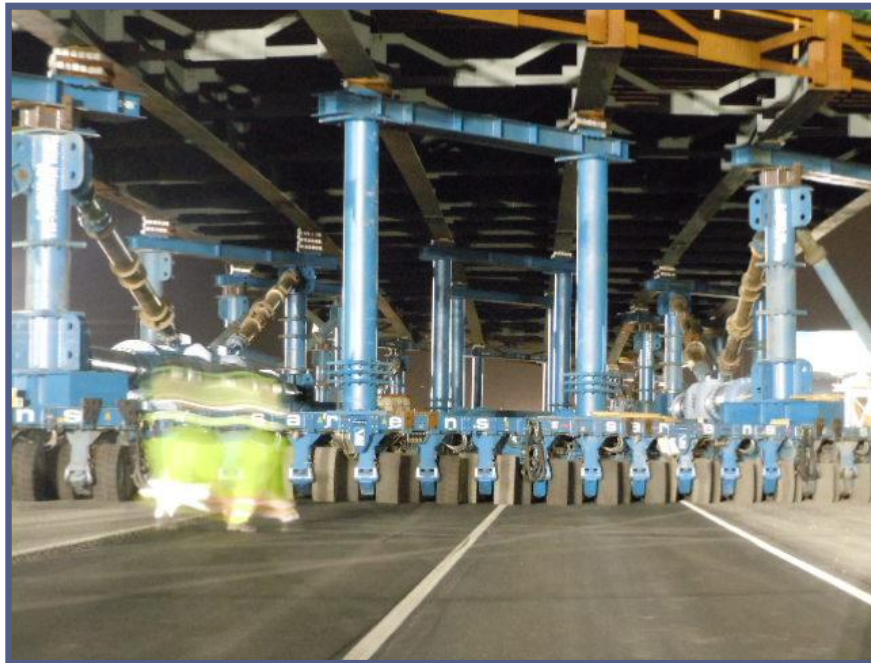
I-15 CORE Proctor Lane over I-15; SPMT; Design-Build



Practice

Project Highlights

I-15 CORE 200 South over I-15; SPMT; Design-Build



Practice

Project Highlights

I-15 CORE Sam White Lane over I-15; SPMT; Design-Build





- SPMT bridge move
 - I-15 CORE Provo Center Street; April 7
- Slide-in
 - I-80 over Weber River; Spring 2011
 - I-80 at Atkinson; Summer 2011
 - I-80 at Summit Park; Summer 2011
- Prefabricated bridge elements
 - SR-193 over UPRR and UTA; Spring 2012

Practice

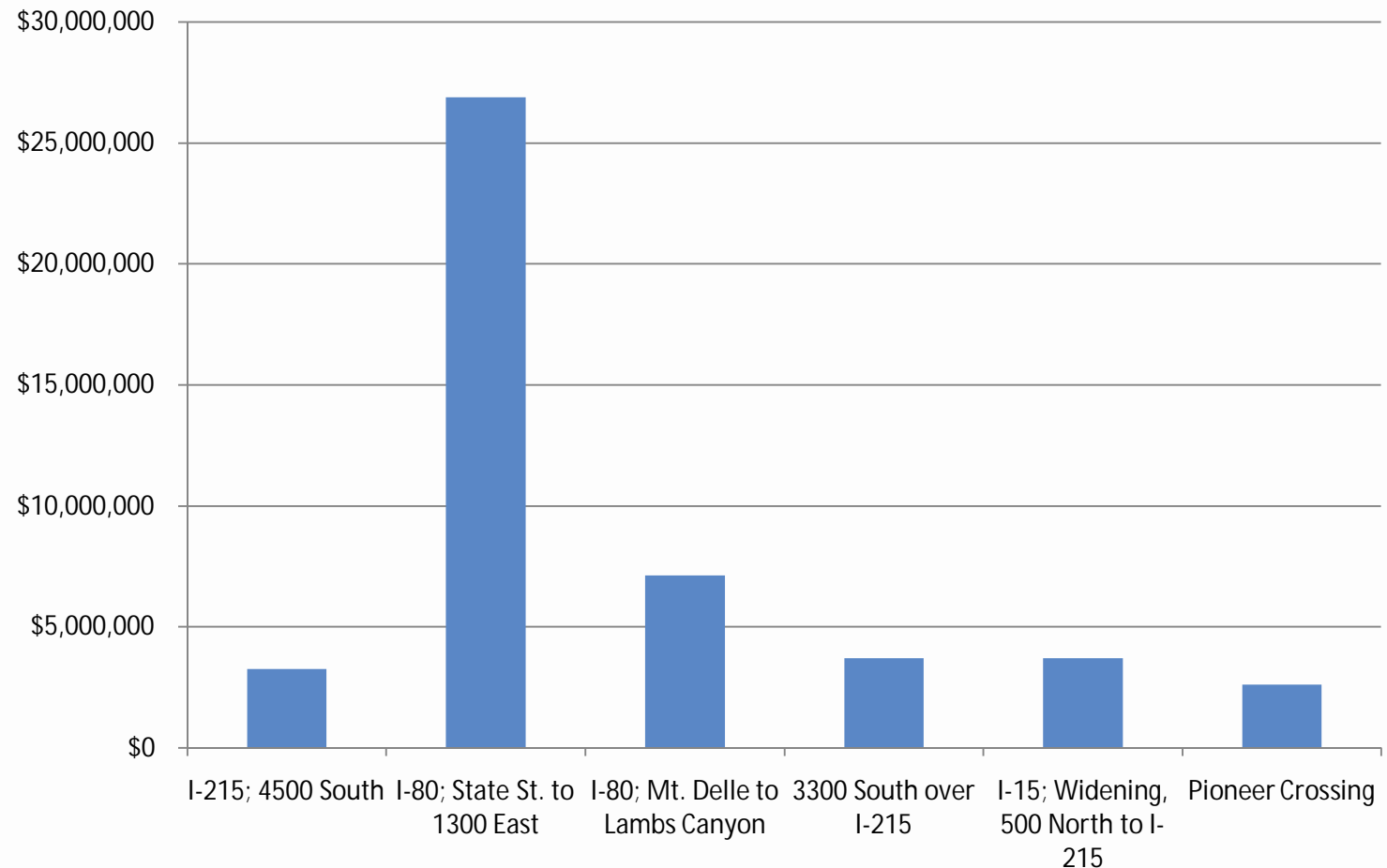
Upcoming Projects



Program Evaluation

Utah ABC Costs; SPMT

Valued Added (includes user cost savings)

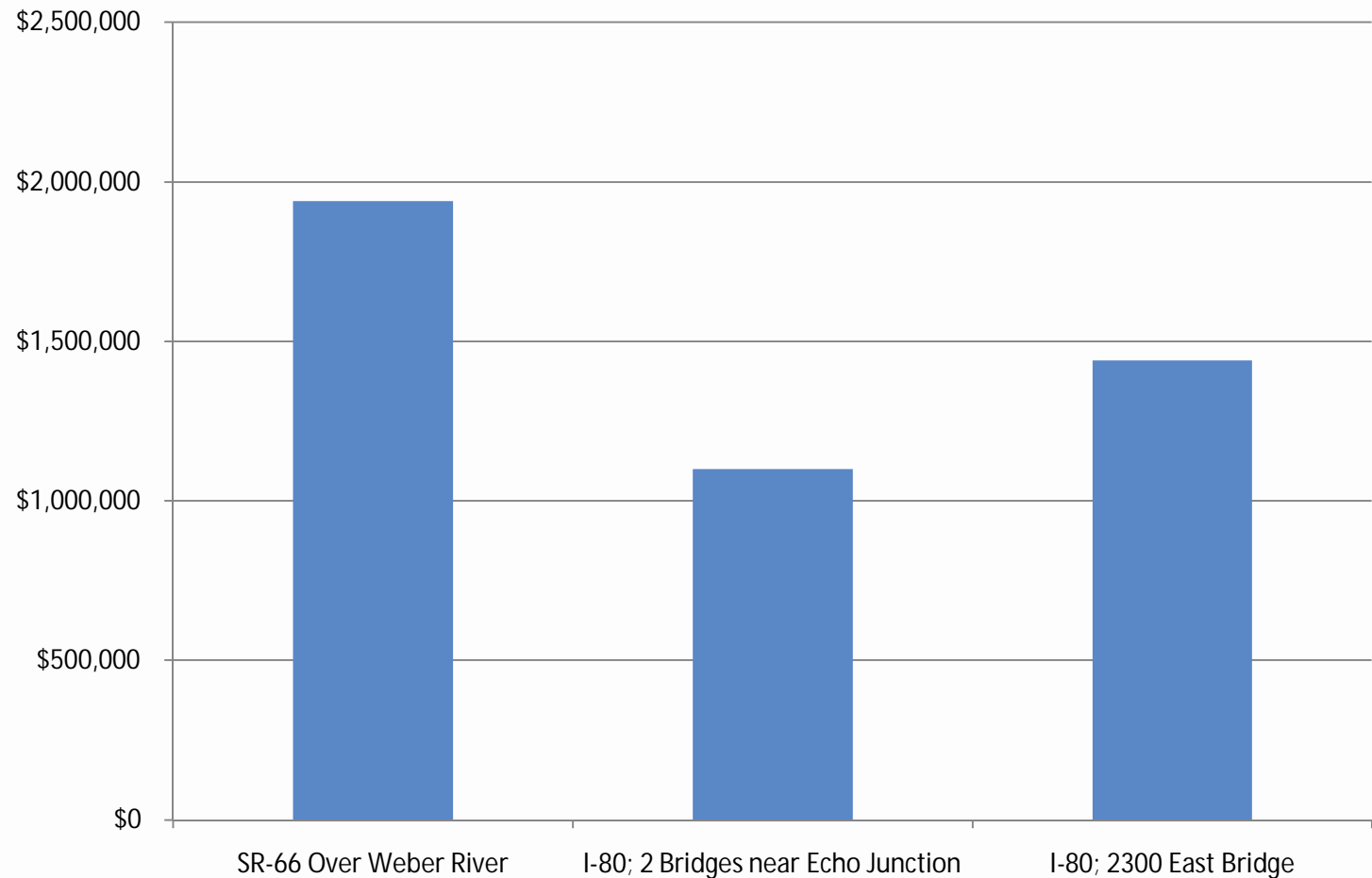




Program Evaluation

Utah ABC Costs; Slide-In

Valued Added (includes user cost savings)

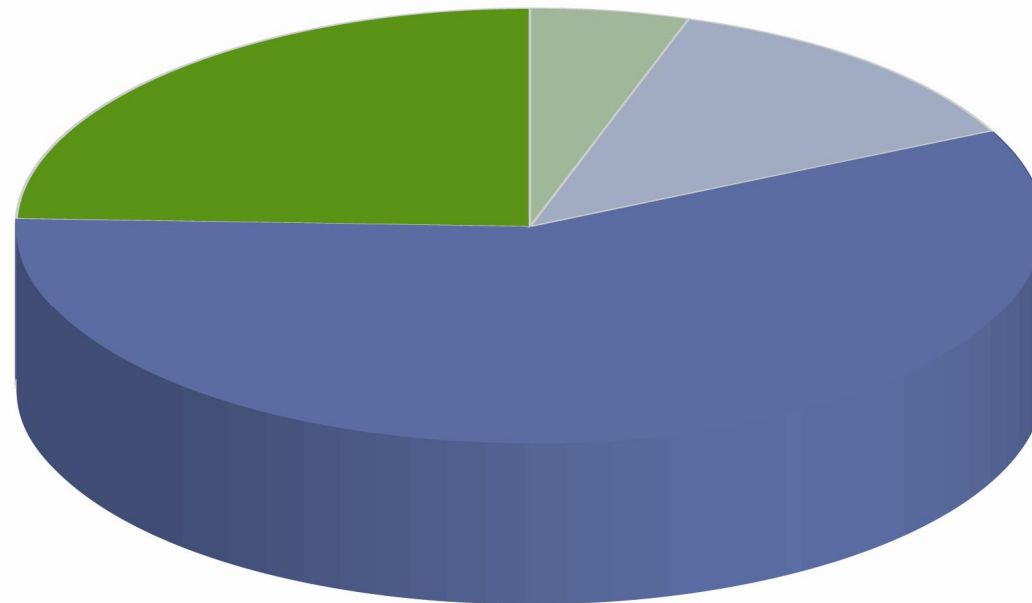




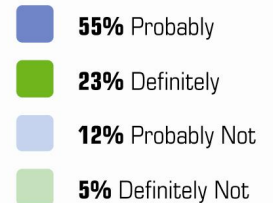
Program Evaluation

ABC Because...

- Value added to the public
- Societal costs minimized
- Public support for innovation
- Political capital



Would you say UDOT is becoming more innovative?



Source: 2010 Dan Jones & Associates

Review

List 3 important aspects of implementing program change.

1. *Research the innovation*
2. *Educate and engage the industry*
3. *Have a plan*



Review

What are key elements for communicating with the public?

1. *Outreach programs*
2. *Messaging*
3. *Visual animation (Simplify the concepts)*



Review

What are three major categories of accelerated bridge construction components?

1. *Foundation and wall elements*
2. *Rapid embankment construction*
3. *Prefabricated bridge elements and systems*
4. *Structural placement methods*
5. *Fast track contracting*



Review

What are the benefits of using ABC and PBES?

1. *Reduced on-site construction time*
2. *Minimized traffic disruption – months to days*
3. *Reduced environmental impact*
4. *Improved work zone & worker safety*
5. *Provides positive cost-benefit ratios when user costs are considered*
6. *Improved product quality – controlled environment, cure times, easier access, etc.*



Review

Why does innovative contracting support ABC?

Innovative contracting compliments ABC by allowing the contractor to work with the designer on constructibility and risk sharing.



Review

What is the major reason owners are choosing ABC?

Minimize impacts to the traveling public.





Thank you...Questions?